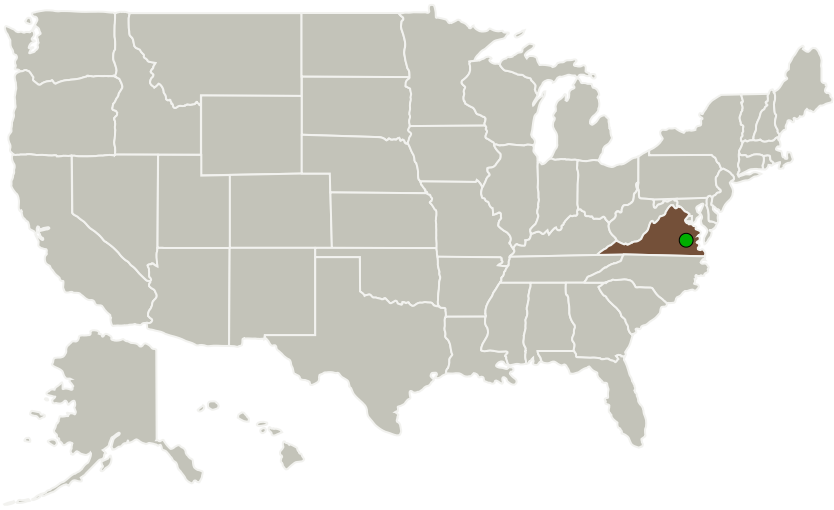
Photo-Enhanced Hydrogen Transport Technology for Clean Renewable Electrochemical Energy Systems, Phase I

Completed Technology Project (2011 - 2012)

Project Introduction

Solid oxide fuel cells and electrolyzers are promising electrochemical devices for space and terrestrial applications due to their high power densities and clean operation. Furthermore, proton-conducting oxides have the potential to allow lower operational temperatures and promote more reliable and longer-lived devices—both valuable attributes for space applications—however, practical devices are not yet realized because of insufficient proton mobility at moderate temperatures. Phenom Technologies, Inc. has identified a new non-thermal technique to dramatically enhance the mobility of protons in solid oxides using resonant infrared irradiation to excite molecular O-H vibrations in the material. In our earlier work, we have shown that this photo-enhanced hydrogen transport effect can increase the proton diffusion rate in solid oxides by nine orders of magnitude. In this Phase I STTR proposal, we will build on our established research to complete a proof of concept study and lay the foundation for Phase II prototype development of a "photo-enhanced" solid oxide electrolyte for fuel cells and electrolyzers. This study will address NASA's need for more reliable and efficient solid oxide electrochemical components for clean renewable energy systems.

Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
Phenom Technologies, Inc	Lead Organization	Industry	Williamsburg, Virginia
Langley Research Center(LaRC)	Supporting Organization	NASA Center	Hampton, Virginia
William & Mary	Supporting Organization	Academia	Williamsburg, Virginia

Primary U.S. Work Locations
Virginia

Project Transitions

February 2011: Project Start

February 2012: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/138402)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Phenom Technologies, Inc

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

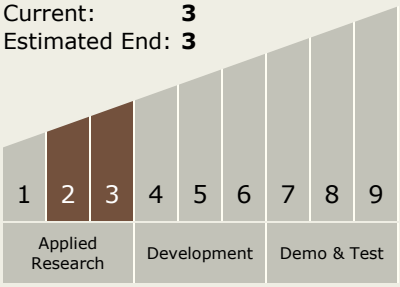
Carlos Torrez

Principal Investigator:

Gunter Luepke

Technology Maturity (TRL)

Start: **2**
Current: **3**
Estimated End: **3**



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Technology Areas

Primary:

- TX03 Aerospace Power and Energy Storage
  - TX03.2 Energy Storage
    - TX03.2.2 Electrochemical: Fuel Cells

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System